DOCUMENT RESUME

ED 290 467 IR 013 124

AUTHOR Flaherty, Robert John
TITLE A Determination of the Relationship between Various Factors and Success on the Advanced Placement Computer Science Examination.
PUB DATE 29 Aug 87
NOTE 46p.; Ed.D. Practicum, Nova University.
PUB TYPE Dissertations/Theses - Practicum Papers (043)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Achievement Tests; Advanced Placement Programs; Aptitude Tests; *Computer Science; Grade Point Average; High Schools; *Mathematics Achievement; Multiple Regression Analysis; *Predictive Measurement; Predictor Variables
IDENTIFIERS *College Board Achievement Tests; Pearson Product Moment Correlation; *Preliminary Scholastic Aptitude Test

ABSTRACT

This study was undertaken to determine whether a significant correlation exists between the student's performance on the Advanced Placement (AP) Computer Science Examination and three factors: (1) mathematics scores on the Preliminary Scholastic Aptitude Test (PSAT); (2) a mathematics index score reflecting mathematics courses taken by the student in high and his/her grades in those courses; and (3) the student's overall grade point average. The data were analyzed by calculating the Pearson product-moment correlation between the scores on the AP examination and the selected factors. A significant correlation at the 5% level was found for the selected factors. Only the highest correlating factor, the PSAT mathematics score, was selected for a regression formula after it was found that the inclusion on the other factors did not contribute significantly to the quality of the prediction. Four appendices provide tables displaying the data collected for the study and a description of the data analysis process. (Author/EW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED290467

P R A C T I C U M

REPORT

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Center for the
Advancement of Education
Ed.D. Program

A DETERMINATION OF THE RELATIONSHIP BETWEEN VARIOUS FACTORS AND SUCCESS ON THE ADVANCED PLACEMENT COMPUTER SCIENCE EXAMINATION

Educational Research

by

Robert John Flaherty, CFX

IR013124

3301 College Avenue
Fort Lauderdale, Florida 33314
305/475-7300

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Robert J. Flaherty

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

NOVA UNIVERSITY

A DETERMINATION OF THE RELATIONSHIP BETWEEN VARIOUS FACTORS AND SUCCESS ON THE ADVANCED PLACEMENT COMPUTER SCIENCE EXAMINATION

Educational Research

by

Robert John Flaherty, CFX
Mount Saint Joseph High School
Baltimore, MD

A PRACTICUM REPORT SUBMITTED TO NOVA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF EDUCATION IN COMPUTER EDUCATION.

AUGUST 29, 1987

XAVERIAN BROTHERS
MOUNT SAINT JOSEPH COLLEGE
4403 FREDERICK AVENUE
BALTIMORE, MARYLAND 21229

Practicum Approval Sheet

This practicum took place as described.

Verifier: Bernd McDivitt

Bernd McDivitt

Assistant Principal

Title

Baltimore, Maryland

Address

September 8, 1987

Date

This practicum report was submitted by Robert John Flaherty, CFX under the direction of the advisor listed below. It was submitted to the Ed.D. Program in Computer Education and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova University.

Approved:

Date of Final Approval of Report

Bert Nelin, Ph.D., Advisor

ABSTRACT

This study was undertaken to determine whether a significant correlation exists between the student's performance on the Advanced Placement Computer Science Examination and the factors of the Preliminary Scholastic Aptitude Test (PSAT) mathematics score, a mathematics index score, and the overall cumulative Grade Point Average (GPA). The information used in the study was taken from the students at the author's high school who took the Advanced Placement Computer Science Examination during the years 1984 through 1986. The data was analyzed by calculating the Pearson product-moment correlation between the scores on the Advanced Placement Computer Science Examination and the selected factors. The selected factors showed a significant correlation at the 5 percent level. Only the highest correlating factor, the PSAT mathematics score, was selected for a regression formula after it was found that the inclusion of the other factors did not contribute significantly to the quality of the prediction.

TABLE OF CONTENTS

Page

ABSTRACT.....ii

INTRODUCTION.....1

STATEMENT OF THE PROBLEM.....2

THE RESEARCH HYPOTHESES.....3

BACKGROUND.....3

DEFINITION OF TERMS.....6

LIMITATIONS OF STUDY.....7

ASSUMPTION.....8

PROCEDURES FOR COLLECTING DATA.....8

PROCEDURES FOR TREATING DATA.....9

RESULTS.....10

DISCUSSION AND CONCLUSIONS.....12

BIBLIOGRAPHY.....17

APPENDICES

A. DATA FOR THE STUDY.....18

B. DISTRIBUTION STATISTICS FOR FACTORS INVOLVED IN THE STUDY.....26

C. CORRELATION AND REGRESSION RESULTS.....30

D. ANALYSIS OF THE DATA.....33

LIST OF TABLES

LIST OF TABLES

Table Page

1. 1984 Sample -- Raw Data.....19
2. 1985 Sample -- Raw Data.....20
3. 1986 Sample -- Raw Data.....23
4. Cross Tabulation of Advanced Placement Computer Science Scores and Junior GPA.....25
5. Cross Tabulation of Advanced Placement Computer Science Scores and Mathematics Index.....26
6. Cross Tabulation of Advanced Placement Computer Science Scores and PSAT Mathematics.....27
7. Distribution Statistics for Factors Involved in the Study.....29
8. Correlation Matrix for the Factors.....31
9. Regression Analysis.....32

INTRODUCTION

With the recent addition of the Advanced Placement Computer Science Examination, a need existed to evaluate possible predictors for a potential student's success. Such predictors will enable both the teacher and the counselor to inform the student about the potential for success on the examination. A study to establish these predictors was conducted on a student sample taken from a private high school in Baltimore, Maryland, who took the examination between 1984 through 1986.

The predictors used were the PSAT test score in mathematics, the student's overall GPA after three years in secondary school, and the student's mathematics index score after three years in secondary school. While the study of computer science may not directly involve the factors, it was considered probable that the student's ability in mathematics was the best predictor that could be found.

The Advanced Placement Computer Science Examination has been administered for the last three years with varying results dependent on the preparation of the students and their ability, interest, and background in logic and reasoning. The student, not necessarily proficient in mathematics, uses the mathematical logic skills to solve the problems in the area of data structures. Further, the solution of any problems in a structured programming language such as Pascal requires the student to think in a

logical way. Thus, the study concentrated on the use of the various mathematics skill indicators as indicators of a student's ability to succeed on the Advanced Placement Computer Science Examination.

THE STATEMENT OF THE PROBLEM

The College Board instituted the Advanced Placement Computer Science Examination in the Spring of 1984, and there existed no suitable way of predicting a student's success on the examination before the student entered into the course of study. Such predictors would allow the teacher to address the individual needs of the students enrolled in the course that prepares them for the examination. The predictors under investigation in this study were the student's PSAT score in mathematics, the student's overall GPA, and the student's mathematics index score (see definition of terms).

The examination part of the advanced placement series given by the College Board during the spring of the year allows a student to gain college credit for their performance on a particular examination. The College Board stated that the goals of the Advanced Placement Computer Science course were [CEEB, 1984:3]:

> comparable to those of a first year course offering in college or university computer science departments. Thus, an AP course in computer science will cover topics that normally comprise six or more semester hours of

college-level computer science course work that could be credited toward a computer science major.

Thus, a method for predicting a student's success on the examination was the objective of the study. The question that had to be answered was whether the use of the PSAT mathematics score, the student's GPA, and the mathematics index score measured the predictability of success on the examination.

THE RESEARCH HYPOTHESIS

The hypothesis was that there was a statistically significant correlation between a student's score on the Advanced Placement Computer Science Examination and each of the following factors: 1. The student's overall GPA. 2. The student's score on the mathematics section of the PSAT/NMSQT test. 3. The student's mathematics index score.

BACKGROUND AND SIGNIFICANCE OF STUDY

During the past three years, an increasing number of students elected to take the Advanced Placement Computer Science Examination. The enrollments for the last three years were 12 in 1984, 45 in 1985, and 17 in 1986. The examination covered the various topics considered part of the freshman college computer science course. At the secondary school level a need existed to counsel students to

take courses that would both challenge their abilities and allow a certain degree of success for the student. Since the advanced placement course in computer science did provide both, it was necessary to limit enrollment to those students who were able to do the class work and had a reasonable chance of success on the examination. Since the selection of students was judgmental, in terms of an adequate predictor for a student's success, it was felt that there should be a way of taking some indicators that are common to all students in a secondary school and use them as a predictor for the student's individual performance on the examination.

The College Board [CEEB, 1984:5] lists the suggested prerequisites for the course as follows:

> The necessary prerequisites for entering the AP Computer Science course include a familiarity with mathematical notation at the level of a second course in Algebra, experience in problem-solving, and an attitude that reflects a well-founded confidence that unfamiliar symbolism can be mastered and will eventually serve as an aid to understanding. Mathematics courses have traditionally offered the secondary-school student the best opportunity to acquire such an attitude.

The prerequisites showed that an adequate preparation in mathematics was essential for success on the examination. Further, the various predictors selected would rely on the measurement of both ability and achievement in the area of mathematics. The PSAT test [CEEB, 1985:3] is:

> The Preliminary Scholastic Aptitude Test/National Merit Scholarship Qualifying Test (PSAT/NMSQT) is a multiple

> choice test of certain developed verbal and mathematical abilities generally associated with academic achievement in college ... The questions in the mathematical section require application of graphic, spatial, numerical, symbolic, and logical techniques in arithmetic, algebraic, and geometric situations. The tests assesses ability to reason with facts rather than recall and recite them.

In a further commentary on the PSAT, the following statement was found about the ability to use PSAT scores as indicators of student performance [CEEB, 1985:30] :

> PSAT/NMSQT scores, useful in themselves, become even more helpful counseling instruments when they are used in combination with other information.

The College Entrance Examination Board [CEEB, 1985] undertook a study to relate the acceptability of students for Advanced Placement programs and related such performances directly to the PSAT mathematics score.

The mathematics index scores reflected the courses and grades in the mathematics courses that the students took during their secondary school career. Braswell [1984] cited that the student should have the ability to solve problems in a logical way, and this function has been the providence of the high school mathematics courses that the students would take during their secondary school studies. Braswell [1984:372] states:

> it is important for secondary school students and their advisors to understand that a foundation in mathematical reasoning should be acquired before attempting AP Computer Science.

The student's total GPA measured the academic performance over the period of years that the student attended secondary school.

DEFINITION OF TERMS

The PSAT/NMSQT test referred to as the PSAT test is an instrument administered by the College Entrance Examination Board that is related to the Scholastic Aptitude Test (SAT). Intended for third year students in secondary school and taken by a select group of second year students during the fall of the year, the PSAT measures the aptitudes of the student with respect to verbal and mathematical skills and reasoning. For the study, all references to the PSAT did refer only to the mathematics section.

The Mathematics Index Score used in the study was an artificially computed index score weighted to the difficulty of the student's courses. It has a range of 0.0 to 6.0, depending on whether the student takes an advanced placement course and what grade that the student received in the course. The Mathematics Index Score reflected a student's performance through the third year of secondary school, since the advanced placement course in computer science is given in the fourth year of secondary school.

The overall Grade Point Average referred to as GPA is found by the same method that is used in all educational

institutions to determine the GPA of a student. Once again, this average will be that of the student after the junior year.

The Advanced Placement Computer Science Examination administered by the College Entrance Examination Board is a nationwide achievement test administered in the spring of the year, typically during the first weeks of May. The scores on the test are given on a scale of 1 to 5. The scores are related to the student's qualifications in the subject according to the following: 5 -- extremely qualified; 4 -- well qualified; 3 -- qualified; 2 -- possibly qualified; and 1 -- no recommendation. For the study, success on the Advanced Placement Computer Science Examination meant a score of 3 or better.

LIMITATIONS OF THE STUDY

The study was conducted on the group of students at the author's high school who took the Advanced Placement Computer Science Examination during the years 1984, 1985, and 1986. This sample represented all the students at the school who took the examination since its inception in 1984. The author's high school is a private, secondary school in Baltimore, Maryland. No attempt is being made to extend the data to the general population of the students in the city of Baltimore, state of Maryland, or the nation. The

variables used will also limit the study. The selection of the various predictors was based on an intuitive guess that these would be the factors that should be considered. It does not mean that there could not be other valid predictors. For example, the ability of a person to communicate effectively in writing may be an additional factor in success on the examination. The final limitation of the study involved the number in the study. The number of students considered in the study was 74. While realizing that the number is small when performing statistical analysis, the study has validity since the number represents, to date, the entire population of students who took the examination.

BASIC ASSUMPTIONS

For the study, the various students who took the Advanced Placement Computer Science Examination had an equal opportunity to succeed. This was the only assumption that was made about the sample that is being considered for the study.

PROCEDURES FOR COLLECTING DATA

The data was presented in tabular form. Each portion of the data was assembled by the year of graduation of the students involved in the study. To ensure that the

confidentiality of the students was maintained, the data was collected and recorded without any specific reference to any student whose academic record was being cited. To obtain the various data for the study, the permanent record cards of the students served as the only source. The various quantities needed for the study were found on one record card.

PROCEDURES FOR TESTING THE DATA

To test the data, a separate null hypothesis was formulated for each of the three factors. The first null hypothesis stated that there was no statistical significance at the 5 percent level in the correlation of the student's overall GPA and the score on the Advanced Placement Computer Science Examination. The second null hypothesis stated that there was no statistical significance at the 5 percent level in the correlation of the student's score on the mathematics section of the PSAT test and the score on the Advanced Placement Computer Science Examination. Finally, the third null hypothesis stated that there was no statistical significance at the 5 percent level in the correlation of the student's mathematics index score and the score on the Advanced Placement computer science examination.

The statistical test applied to determine whether to accept or reject the null hypothesis was the Pearson

product-moment correlation. If the correlation coefficient had an absolute value greater than 0.232, the null hypothesis was rejected, and it was inferred that there was a significant correlation for the corresponding factor. The same test was applied to all the null hypotheses.

To complete the study, a multivariate regression analysis was performed to formulate a regression equation that relates the factors to the score on the Advanced Placement Computer Science Examination. It was felt that this analysis provided a useful result even if one or two factors did not prove statistically significant.

RESULTS

The raw data, presented in Tables 1, 2, and 3 (Appendix A) was analyzed to ascertain the acceptance or rejection of the null hypotheses previously stated. The distribution statistics for the various quantities involved in the study are presented in Appendix B.

Each factor was treated with the Pearson product-moment correlation and compared to the value of 0.232 with the results of the correlation study shown in Appendix C. To obtain verification of the results, the statistical analysis was done on the Nova University VAX 11/780 mainframe computer using the S statistical package, and on a Macintosh Plus personal computer using the Statworks software package. The details of the various steps in the processing of the

data are presented in Appendix D. The first factor treated was the student's overall GPA after the third year of secondary school. A correlation coefficient of 0.364 was calculated. Since the value exceeds 0.232, the null hypothesis was rejected, and the inference was made thatthere is a statistically significant correlation at the 5 percent level between the Advanced Placement Computer Science Examination scores and the overall GPA after three years in secondary school.

The second factor to be treated, was the PSAT mathematics score, and the correlation coefficient obtained was 0.429. Again, the null hypothesis was rejected, and the inference made was that there is a statistically significant correlation at the 5 percent level between the Advanced Placement Computer Science Examination score and the PSAT mathematics score.

Finally, the mathematics index score was treated and the correlation coefficient was calculated to be 0.317. Since the value exceeds 0.232, the null hypothesis was rejected, and the inference was made that there is a statistically significant correlation at the 5 percent level between the Advanced Placement Computer Science Examination score and the mathematics index score.

Since the various factors were statistically significant, a multivariate regression analysis was undertaken. The correlation matrix, presented in Table 8

(Appendix C) shows that there was a high correlation among the factors, so the data was analyzed to determine the influence of each factor on the standard error in the regression formula. The first step in the process was the formation of a regression equation using the highest correlating factor, the PSAT mathematics score. The resulting standard error was 1.005. The details of the analysis are given in Appendix D. The next step was the addition of the second highest correlating factor and the determination of the standard error for the new regression formula. With the addition of the GPA after the junior year, the standard error was calculated to be 1.003. Finally, the last factor was added to the analysis, and the standard error was calculated to be 1.005. The comparison of the results shows that the two factors, the GPA after the junior year and the mathematics index score, do not contribute significantly to prediction of the advanced placement score. Therefore, it was concluded that the regression formula should only be based on the PSAT mathematics score. The resulting equation is presented below:

$$ap = 0.049(psat) - 0.735 \qquad (1)$$

where

ap = advanced placement score in computer science

psat = PSAT mathematics score.

DISCUSSION AND CONCLUSIONS

The data in Appendix B shows a wide distribution of the various factors. There are some observations that can be made regarding these distributions. The first was that students who elected to take the examination were not suitably counseled regarding the difficulty and scope of the examination. Further, there had been no adequate method for predicting the student's potential success on the Advanced Placement Computer Science Examination; but, the data in Appendix A shows that there will be a certain small percentage of the students who can be termed over-achievers who will defy the predictions and do well on the examination.

The general low level of the Advanced Placement Computer Science Examination scores, shown in Appendix B, can be attributed, in part, to the particular nature of the school calendar of the author's school. It has been the practice of the school to complete the senior year before the administration of the advanced placement examinations. This means that the students are no longer in the school atmosphere, and the regimen of study habits has been broken; thus, the individual preparation of the students has been mediated by other activities associated with the end of the school year. In part, a recent change in the school calendar should alleviate this problem.

Another area reflected in the scores of some students

is a lack of understanding of the field of computer science. Some students felt that an advanced placement course in computer science should be an extension of the computer literacy course. As the novelty of the computer in the school eroded, the students developed a more informed approach to the computer in general and the advanced placement program in particular. The trend appears to be that the students who are now enrolling in the advanced placement computer science program are better students and have no misconceptions about the course.

Another consideration is the fluid nature of the Advanced Placement Computer Science Examination. Since its inception in 1984, there have been major additions to the topic outline for the course and examination. While the other segments of the advanced placement program have remained stable, the advanced placement computer science program is still undergoing a period of revision and redefinition. The result is a course that has to be constantly revised and expanded. To address the concern, the course has been expanded to cover two years instead of one. It is hoped that this will allow the student the opportunity to acquire the large and changing corpus of material that is part of computer science.

A recommendation for further study would be to add the ability of the student to communicate effectively as a factor in the study. One principle of writing is the

refinement of ideas into a clear, concise form. The area of computer science requires that a student be able to formulate algorithms that are built with the same goals as that of effective writing. The writing process encourages the student to develop ideas and refine them through the process of revision, and the programming process requires the student to engage in the process of refinement and revision to develop the final program. Further, as the student becomes more proficient in the writing process, the student develops the process of logical thought and organizational skills that have a parallel to computer science.

Another recommendation for further study would be to expand the scope of the study to include students who are in other schools and other geographical areas. There has been no attempt to develop any comparisons based on demographics and a heterogeneous student distribution.

In conclusion, the study has resulted in the development of a regression formula that can be used to predict the student's performance on the advanced placement examination in computer science based on the student's PSAT mathematics score. The study showed that the factors of GPA after the third year of secondary school and mathematics index score correlated significantly with the student's performance on the advanced placement examination in computer science but did not contribute significantly to the

regression formula based on the PSAT mathemtics score.

BIBLIOGRAPHY

BIBLIOGRAPHY

Braswell, James S. "Advanced Placement Computer Science." Mathematics Teacher , 55: 372-379. May, 1984.

CEEB, "1985 PSAT/NMSQT Interpretative Manual," College Entrance Examination Board, 1985.

CEEB, "A Guide to the Advanced Placement Examination in Computer Science," College Entrance Examination Board, 1984.

CEEB, "Using the PSAT/NMSQT to Help Identify Advanced Placement Students," College Entrance Examination Board, 1985.

APPENDIX A

Data for the Study

Table 1

1984 Sample -- Raw Data

A. P. Computer Science	Junior GPA	Math Index	PSAT Math
4	3.30	3.00	42
3	3.70	4.15	65
3	3.80	4.67	69
2	3.14	3.38	61
2	3.00	3.50	50
1	2.85	2.75	59
1	3.18	2.50	54
1	3.33	3.72	52
1	3.43	3.77	63
1	3.61	4.45	53
1	2.91	3.20	50
1	2.53	2.00	44

Table 2

1985 Sample -- Raw Data

A. P. Computer Science	Junior GPA	Math Index	PSAT Math
5	3.65	4.50	67
4	3.05	3.00	58
4	3.46	4.67	73
4	4.00	4.18	69
4	3.95	4.70	62
3	3.32	4.00	60
3	3.12	3.80	58
3	3.37	3.00	48
3	3.80	5.17	65
3	3.17	4.40	63
3	3.00	2.50	57
2	3.05	3.50	57
2	3.07	2.75	51
2	2.40	1.25	49
2	2.93	4.60	51

Table 2 (Continued)

A. P. Computer Science	Junior GPA	Math Index	PSAT Math
2	3.26	4.17	63
2	4.00	4.80	63
2	3.12	4.00	62
2	3.44	4.50	56
2	3.10	4.67	65
1	3.36	3.75	44
1	3.06	2.25	53
1	3.79	4.00	52
1	2.93	3.00	59
1	2.51	2.50	42
1	2.80	2.75	50
1	3.10	3.00	51
1	3.20	3.25	53
1	3.05	2.75	50
1	3.60	4.00	63
1	2.68	2.00	38

Table 2 (Continued)

A. P. Computer Science	Junior GPA	Math Index	PSAT Math
1	1.71	2.00	38
1	3.26	3.50	59
1	3.18	3.00	53
1	2.32	2.67	53
1	3.60	3.33	46
1	2.56	3.25	43
1	2.95	5.00	56
1	2.29	1.67	36
1	3.59	4.75	62
1	3.30	4.00	65
1	2.58	2.60	60

Table 3

1986 Sample -- Raw Data

A. P. Computer Science	Junior GPA	Math Index	PSAT Math
5	3.96	5.00	71
4	1.89	1.33	55
3	3.12	3.60	55
3	3.40	4.00	74
3	2.74	2.00	42
2	2.85	2.50	34
2	2.42	1.50	51
2	2.58	2.75	57
2	3.67	4.67	72
2	3.10	2.50	52
2	3.18	3.00	53
2	3.03	2.50	38
1	2.64	2.25	40
1	3.16	2.50	35

Table 3 (Continued)

A. P. Computer Science	Junior GPA	Math Index	PSAT Math
1	1.67	2.00	47
1	2.86	2.00	42
1	2.17	1.75	39
1	2.66	2.75	46
1	2.73	3.33	52
1	3.27	4.00	48

Table 4

Cross Tabulation of

Advanced Placement Computer Science Scores and Junior GPA

A. P. Score	Junior GPA 1.5-1.99	2.0-2.49	2.5-2.99	3.0-3.49	3.5-4.0
5	0	0	0	0	2
4	1	0	0	3	2
3	0	0	1	7	3
2	0	2	3	11	2
1	2	3	14	13	5

Table 5

Cross Tabulation of Advanced Placement

Computer Science Scores and Mathematics Index Scores

A. P. Score	Mathematics Index Score				
	1.-1.99	2.-2.99	3.-3.99	4.-4.99	5.-5.99
5	0	0	0	1	1
4	1	0	2	3	0
3	0	2	3	5	1
2	2	5	4	7	0
1	2	16	11	6	1

Table 6

Cross Tabulation of Advanced Placement

Computer Science Scores and PSAT Mathematics Scores

A. P.	PSAT Mathematics Score				
Score	30-39	40-49	50-59	60-69	70-79
5	0	0	0	1	1
4	0	2	1	2	1
3	0	2	3	5	1
2	2	1	9	5	1
1	4	11	17	5	0

Appendix B

Distribution Statistics for

Factors Involved in the Study

Table 7

Distribution Statistics for

Factors Involved in the Study, N = 74

Item	A.P. Scores	Junior GPA	Math Index	PSAT Math
Minimum	1	1.670	1.250	34
Maximum	5	4.000	5.170	74
Range	4	2.330	3.920	40
Mean	1.892	3.075	3.295	53.811
Median	1.500	3.110	3.250	53.000
Std Error	0.128	0.059	0.116	1.128
Std Deviation	1.105	0.506	0.999	9.702
Coeff of Variance	58.407	16.444	30.308	18.030
Skewness	1.052	-0.491	-0.023	0.005
Kurtosis	0.128	0.284	-0.983	-0.721

APPENDIX C

Correlation and Regression Results

Table 8

Correlation Matrix for Factors

	AP Score	Junior GPA	Mathematics Index	PSAT Mathematics
AP Score	1.000	0.364	0.317	0.429
Junior GPA	0.364	1.000	0.792	0.628
Math Index	0.317	0.792	1.000	0.726
PSAT Math	0.429	0.628	0.726	1.000

Table 9

Regression Analysis

Dependent Variable : Advanced Placement Score

Variable Name	Coefficient	Std Error Estimate	t Statistic	Probability > t
Constant	-0.735	0.663	-1.109	0.271
PSAT Math	0.049	0.012	4.026	0.000

APPENDIX D

ANALYSIS OF THE DATA

ANALYSIS of DATA

The main vehicle for the analysis of the data for the study was the StatWorks package for the Macintosh Plus computer. The package is completely menu-driven using the pull-down menus associated with the Macintosh architecture. The data was entered into the data section of the program using a columnar format with the various columns labeled with the name of the particular factor.

The first part of the statistical analysis was the determination of the distribution statistics as presented in Table 7 (Appendix B). The program provided the results using the descriptive statistics option on the menu bar. The items for each factor involved in the study represent the output derived from that segment of the program. The distribution statistics can be divided into two categories: measures of central tendency and measures of dispersion. The items cited that are measures of central tendency are the mean, median, maximum, minimum, range, and standard error. The measures of dispersion are the variance, standard deviation, skewness, and kurtosis. Specifically, skewness is a measure of the symmetry of the distribution, with a value of zero defined as a normal curve, and negative value indicating a distribution skewed to the left, and a positive value indicating a distribution skewed to the right. The kurtosis is a measure of the "peakedness" of the

distribution with the value of zero indicating a normal distribution of the data.

The next step in the process was the determination of the correlation between the various factors and the Advanced Placement Examination in Computer Science scores. Each of the factors was processed through the Pearson product-moment correlation using the correlation option on the menu bar. The values obtained are reported in the first column of Table 8 (Appendix C).

The correlations, meeting the criterion for the acceptance of the research hypothesis, were examined and the construction of the regression formula began. Selecting the regression option, the multivariate regression was computed. This resulted in the correlation matrix, Table 8 (Appendix C). The results showed a strong correlation among the various factors involved in the study, and the question of the need of using all the factors to build a valid regression formula was advanced. Using the PSAT mathematics score, the highest correlating factor, a simple regression was performed, and a standard error of 1.005 was computed. Adding the second highest correlating factor, the GPA after three years of secondary school, a second regression formula was calculated and a standard error of 1.003 was obtained. The addition of the third factor resulted in a standard error of 1.005. An inspection of the values for standard error shows that the second and third factors do not

contribute significantly to the prediction, therefore it was decided that the simple regression formula, equation (1), would represent the results of the study.

The correlation matrix in Table 8 (Appendix C) shows the interrelationship of the various factors that led to the formulation of the simple regression formula for predicting the Advanced Placement Examination in Computer Science scores using only the PSAT mathematics score. Table 9 (Appendix C) shows the various statistics associated with the development of the regression formula. Note that the results obtained for the simple regression did not vary greatly from those for the multivariate regression that was conducted for three factor. This adds credence to the use of the simple regression formula for the prediction of the values.

To verify the results, the data was transported to the VAX 11/780 from the Macintosh, and the analysis was repeated using the functions in the S statistical package running under the Unix operating system. The distribution statistics were obtained using the stem, mean, and var functions of the S package. The results obtained were identical to those calculated using the Macintosh. The correlation results were obtained using the corr function in the S package. Again, the results were identical. Finally, the regression analysis was performed in the S package using the regress and regrpt functions of the S package. The

results obtained were identical to those using the Macintosh leading to the conclusion that the statistical analyses of the data were correct, and the computations were valid.